For Access to Operational Model Data

Real Time
NOMADS Component

(NOAA Operational Model Archive and Distribution System)

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Earth Science Portal 06/9//04

where the nation's climate and weather services begin

Real-Time NOMADS is a service for science, development and public access.

To distribute NCEP's Operational data sets to researchers and the public.

To provide server software to NOAA projects who need to serve their data through web services.

- NCEP NOMADS servers are the intermediary between NCEP operational computers and NCDC NOMADS archive servers.

Servers provide Tools for Users who need digital data

- Pare down large file sizes of high resolution initialization and model results.
- (re-) Group different data sets to create needed products – such as initialization files for model development.
- Subset the data sets in parameter space
- Subset the data sets in physical space

(subset the grid in 4 dimensions)

NCEP Real-Time NOMADS Server

- Real time.
- Operational Suite of Model products.
- Forecast information for model comparison.
- Operational initialization and observations files.
- Maintenance of codes.
- Utilities for data manipulation and grid transformation & sub-setting.
- Documentation.
- Serves as transfer point to NCDC for NOMADS archive of reruns and retrospectives. The goal is a seamless data archived from 2000 to the present.

The Server – Client distributed relationship: A Common Sense Approach to Data Distribution

Examples of Clients :

- ftp2u, Great Displays (pdisp plot), and GrADS allow sub-setting of data by parameter, by 3D region, and by time.
- Allows for results with low band width! Eg., NASA/GSFC takes 1 hour to ftp entire GFS (AVN) forecasts or 13 seconds to download their desired fields (ftp2u).
- "Great Displays" (pdisp) A display program operating from the same database as ftp2u to display any part of the NCEP data base by time, region, vertical level and variable.

More on ftp2u …

It will slice! It will dice! It will repackage GRIB files! And send the results to your ftp server or ours. Place the resulting URL in a Unix script "for" loop and watch it churn out data!

- ftp2u is a client application that filters GRIB files in the 3 space dimensions, time and parameter space.
- ftp2u will send the repackaged GRIB file to your ftp server or ours for later download via http or ftp services.
- The original GRIB files can be obtained with *ftp* at nomad1[2][3].ncep.noaa.gov (eg., nomad3 has ensembles)

cd /pub/ens/archive/ensyyyymmdd for low resolution

cd /pub/enshires/archive/ensyyyymmdd for high resolution

The URL from the ftp2u session

(for those with Unix knowledge)

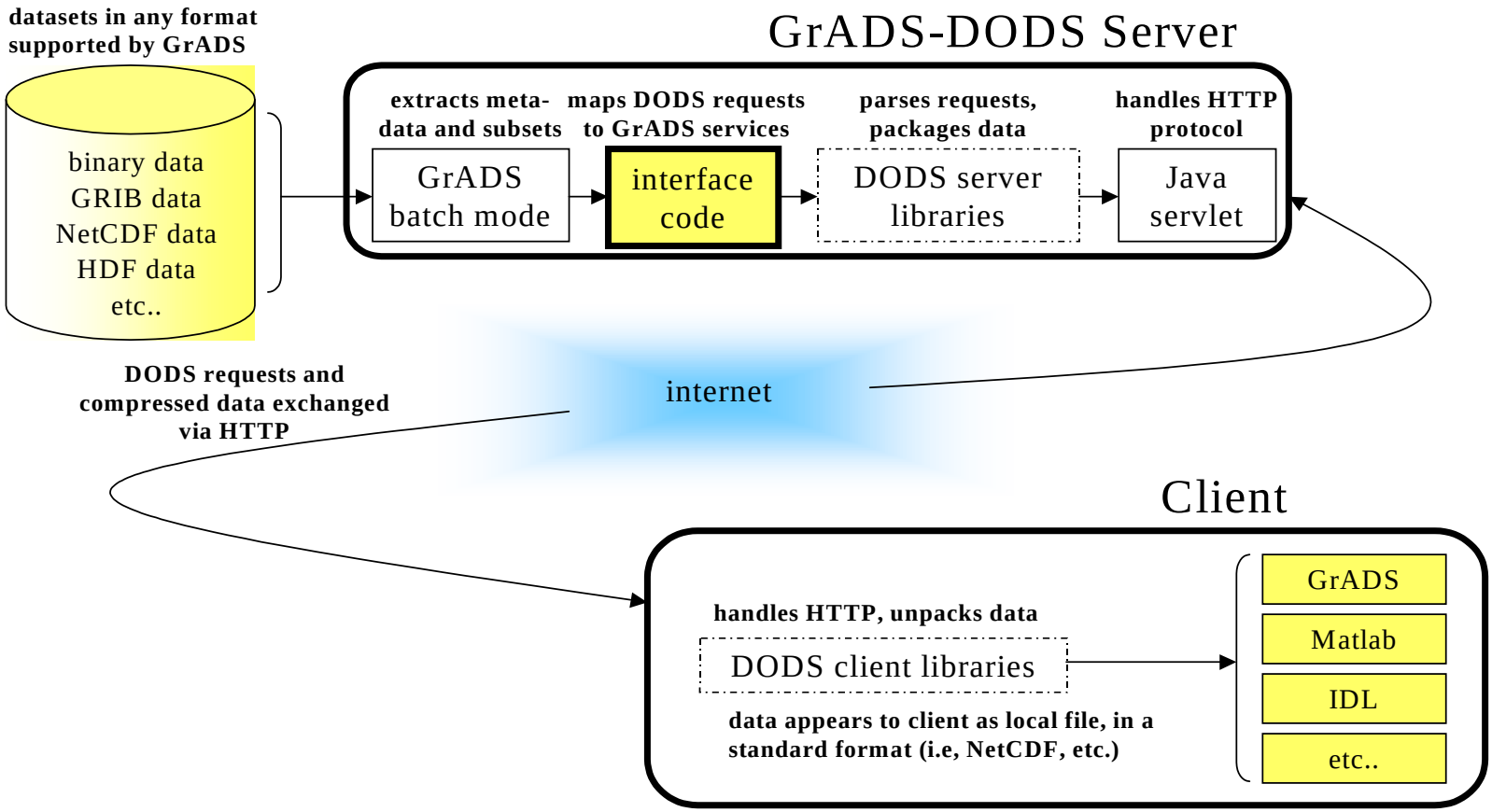
- The URL from a successful *ftp2u* session can be changed and re-issued in any browser.
- In Unix script the URL may become the "quoted object" of a *'wget'* (or wwwgrab, etc…) command. Control the script actions with script ($…) variables.
- Unix script '*for loops'* can allow users to obtain many files but we ask users to please include a '*sleep 30'* (wait 30 seconds) inside the loop to stop tight loops from accidentally occurring, otherwise throttles will apply.
- Place scripts in '*cron'* for automatic file retrieval.

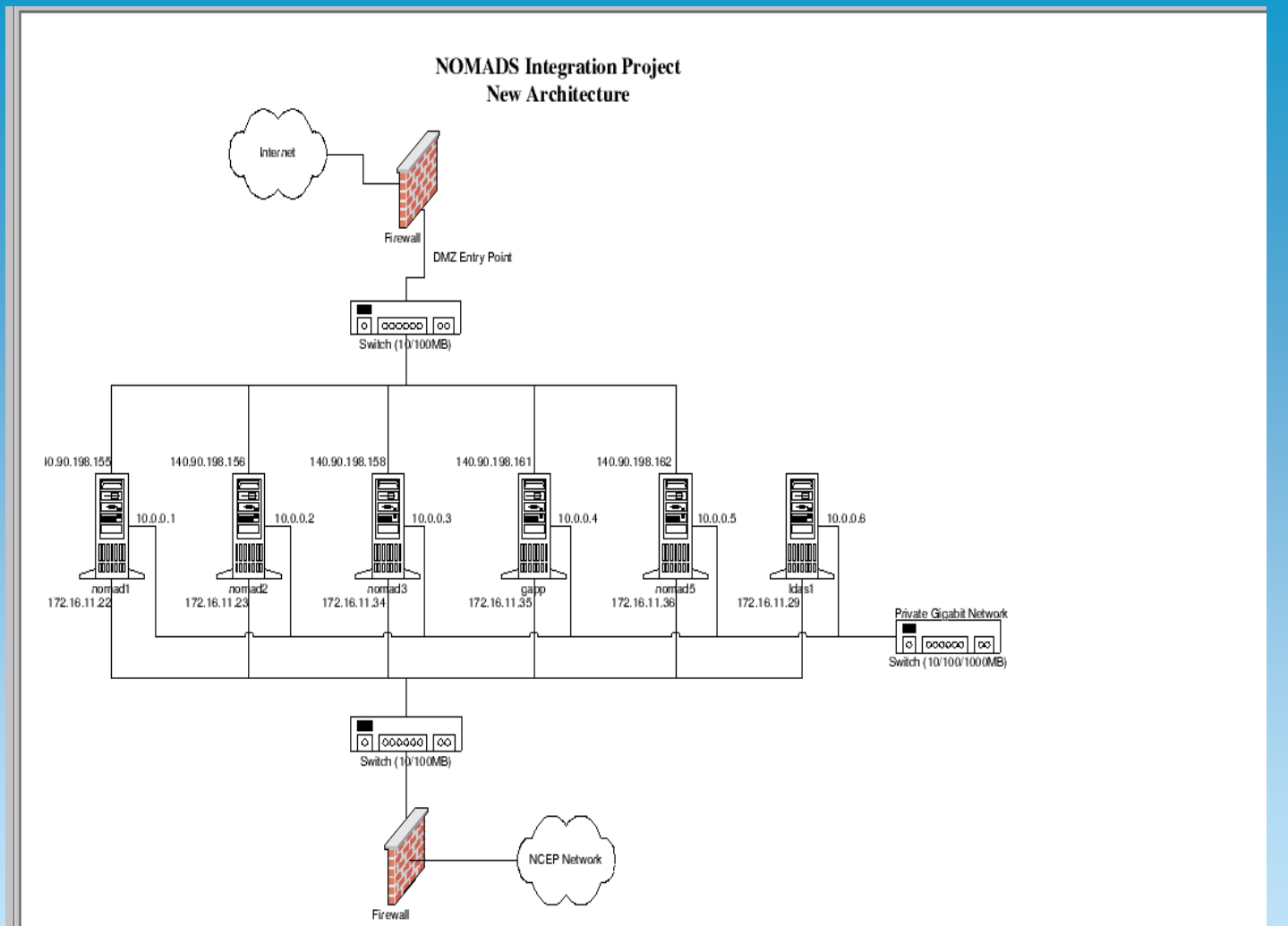
The GrADS-DODS Server (GDS)

- NOMADS participants serve their data sets through a client-server relationship, that is, the data sets are internet ready and the display is done by the client.
- GDS combines both GrADS, a freeware client (from COLA) and DODS (OPeN-DAP) server to compress and exchange data in many formats with http.
- **This means that NCEP data can appear to the user or client application as a local file!**

  Like Network File System over the web!
- DODS requests are made by many freeware and commercial high level language clients.
- Simple http queries to the DODS server can create value added products.

Data Application Protocol (DAP) using…




NOMADS Integration Project
New Architecture
Internet
Firewall
DMZ Entry Point
Switch (10/100MB)
140.90.198.155
140.90.198.156
140.90.198.158
140.90.198.161
140.90.198.162
10.0.0.1
10.0.0.2
10.0.0.3
10.0.0.4
10.0.0.5
10.0.0.6
nomad1
172.16.11.22
nomad2
172.16.11.23
nomad3
172.16.11.34
gabp
172.16.11.35
nomad5
172.16.11.36
ldas1
172.16.11.29
Private Gigabit Network
Switch (10/100/1000MB)
Switch (10/100MB)
Firewall
NCEP Network

NCEP Model Data Sets

- Each RT-NOMAD server contains a header web page (under construction) pointing to various documentation, explanations, and status links and....
- A table listing several data sets. By clicking on the appropriate command, you can (1) make plots, (2) *ftp2u* the files to your computer or (3) obtain DODS metadata descriptions or other data set documentation.

NOMADS: NCEP server 2

Plots, Data, Points of Contact

The following table list several data sets. By clicking on the appropriate command, you can (1) make plots, (2) FTP the files to your computer or (3) obtain documentation. At this time, some options are not available (N/A). BTW, we know that plots can, at times, be quite slow to produce.

Data Set	freq	plot	ftp	doc	gds	contact 1	contact 2
NCEP/DOE Reanalysis (Reanalysis-2)							
Reanalysis-2 pressure level	4x daily	plot	ftp2u ftp	doc	DODS	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov
Reanalysis-2 non-pressure level	4x daily	plot	ftp2u ftp	doc	DODS	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov
Reanalysis-2 spectral sigma analyses	4x daily	N/A	ftp2u ftp	doc	N/A	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov
Reanalysis-2 sfcanl (to run model)	4x daily	N/A	ftp	doc	N/A	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov
Reanalysis-2 pressure level	monthly mean	plot	ftp2u ftp	doc	DODS	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov
Reanalysis-2 non-pressure level	monthly mean	plot	ftp2u ftp	doc	DODS	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov
Reanalysis-2 diabatic heating etc	monthly mean	plot	ftp2u ftp	doc	DODS	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov
NCEP/DOE Reanalysis (Reanalysis-2) Rotating Archive, latest analyses							
Reanalysis-2 pressure level	4x daily rotating	plot	ftp2u ftp	doc	DODS	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov
Reanalysis-2 non-pressure level	4x daily rotating	plot	ftp2u ftp	doc	DODS	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov
Reanalysis-2 model init conditions	4x daily rotating	N/A	ftp2u ftp	doc	DODS	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov
CDAS-NCEP/NCAR Reanalysis							
N/N Reanalysis	4x daily	plot	ftp2u	doc	DODS	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov

pressure level			ftp				
N/N Reanalysis non-pressure level (6hr fcsts, 0-6hr averages)	4x daily	plot	ftp2u ftp	doc	DODS	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov
N/N Reanalysis recent sigma files	4x daily	N/A	ftp	doc	N/A	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov
N/N Reanalysis recent sfcanl files	4x daily	N/A	ftp	doc	N/A	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov
N/N Reanalysis pressure level	monthly mean	plot	ftp2u ftp	doc	DODS	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov
N/N Reanalysis Gaussian grid non-pressure level	monthly mean	plot	ftp2u ftp	doc	DODS	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov
N/N Reanalysis lat-lon non-pressure level	monthly mean	plot	ftp2u ftp	doc	DODS	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov
N/N Reanalysis rotating archive	4x daily	plot	ftp2u ftp	doc	DODS	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov
N/N Reanalysis rotating archive	daily average	plot	ftp2u ftp	doc	DODS	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov
GDAS: FNL Operational Analysis (real time)							
GDAS (FNL) analyses	4x daily rotating	plot	ftp2u ftp	N/A	DODS	Wesley.Ebisuzaki@noaa.gov	Jun.Wang@noaa.gov
Climate Monitoring (real time)							
OLR	pentad	plot	ftp	N/A	N/A	John.Janowiak@noaa.gov	(none)
OLR						John.Janowiak@noaa.gov	(none)

anomaly	pentad	plot	ftp	N/A	N/A		
OLR	monthly mean	plot	ftp	N/A	N/A	John.Janowiak@noaa.gov	(none)
SST	weekly/monthly means	plot	ftp2u ftp	doc	N/A	Diane.Stokes@noaa.gov	(none)
Climate Monitoring (delayed updates)							
AMIP	12 hours	plot	ftp2u	N/A	DODS	Jordan.Alpert@noaa.gov	Suranjana.Saha@noaa.gov
Extended Reconstructed SST	weekly/monthly means	plot	ftp2u ftp	N/A	N/A	Tom.Smith@noaa.gov	(none)
Observations							
sample	monthly	N/A	N/A	N/A	N/A	sk.yang@noaa.gov	(none)
Forecasts							
GFS High Resolution (rotating)	6 hours	plot	ftp2u	N/A	DODS	Jordan.Alpert@noaa.gov	Wesley.Ebisuzaki@noaa.gc
GFS High Resolution (2 month archive)	6 hours	plot	ftp2u	N/A	DODS	Jordan.Alpert@noaa.gov	Wesley.Ebisuzaki@noaa.gc
GFS Low Resolution (2 month archive)	12 hours	plot	ftp2u	N/A	DODS	Jordan.Alpert@noaa.gov	Wesley.Ebisuzaki@noaa.gc
ETA	6 hours	plot	ftp2u	N/A	DODS	Jordan.Alpert@noaa.gov	Jun.Wang@noaa.gov
ETA_AWIP 218	12 hours	N/A	ftp2u	N/A	DODS	Jordan.Alpert@noaa.gov	N/A
RSM	1 month	plot	ftp2u	doc	DODS	Henry.Juang@noaa.gov	Jun.Wang@noaa.gov

Questions and Suggestions

- Why do I meet overloaded problem recently?
  - A: Currently the system will reject any access when the system's load average is high.
- If the files you requested are not up to date or are missing, please report to the contract peosons.
- If NOMAD2 looks offline or you meet problem saying that the server is busy or it's down, please report to the contract persons.

Definitions and Links

GFS(AVN)	Aviation run, now called GFS Global Forecast Model
CDAS	Climate Data Assimilation System (Reanalysis), Global T62 Reanalysis model
CAMS	Climate anomaly monitoring system
CERES	NASA Cloud and Earth Radiant Energy System
CMB	Climate modeling branch (EMC)
CMF	Coupled model forecast
CPC	Climate Prediction Center
EMC	Environmental Modeling Center
ERBE	NASA Earth Radiation Budget Experiment
ETA	high resolution regional model
FNL	final analysis, used as initial conditions for the GFS(AVN) and GFS(MRF)
GDAS	Global Data Assimilation System, global T126 operational model
GRIB	WMO standard for encoding gridded fields
ISCCP	International Satellite Cloud Climatology Project
LaRC	NASA Langley Research Center
GFS(MRF)	Medium Range Forecast, Global operational Forecast System, run at 00Z
NCEP	National Centers for Environmental Prediction, part of NWS
NGM	Nested Grid Model, an older regional model
NVAP	NASA Water Vapor Project
NWS	National Weather Service, part of the Department of Commerce
OI	Optimal interpolation
OLR	Outgoing Long-wave Radiation
OMB	Ocean Modeling Branch (EMC)
PATMOS/CLAVR	Pathfinder Atmospheric data/Cloud from AVHRR
RSM	Regional Spectral Model
SST	Sea surface temperature
TOA	Top of atmosphere
TRMM	NASA Tropical Rainfall Measurement Mission

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comments, suggestions: Wesley.Ebisuzaki@noaa.gov

An Aggregate Server

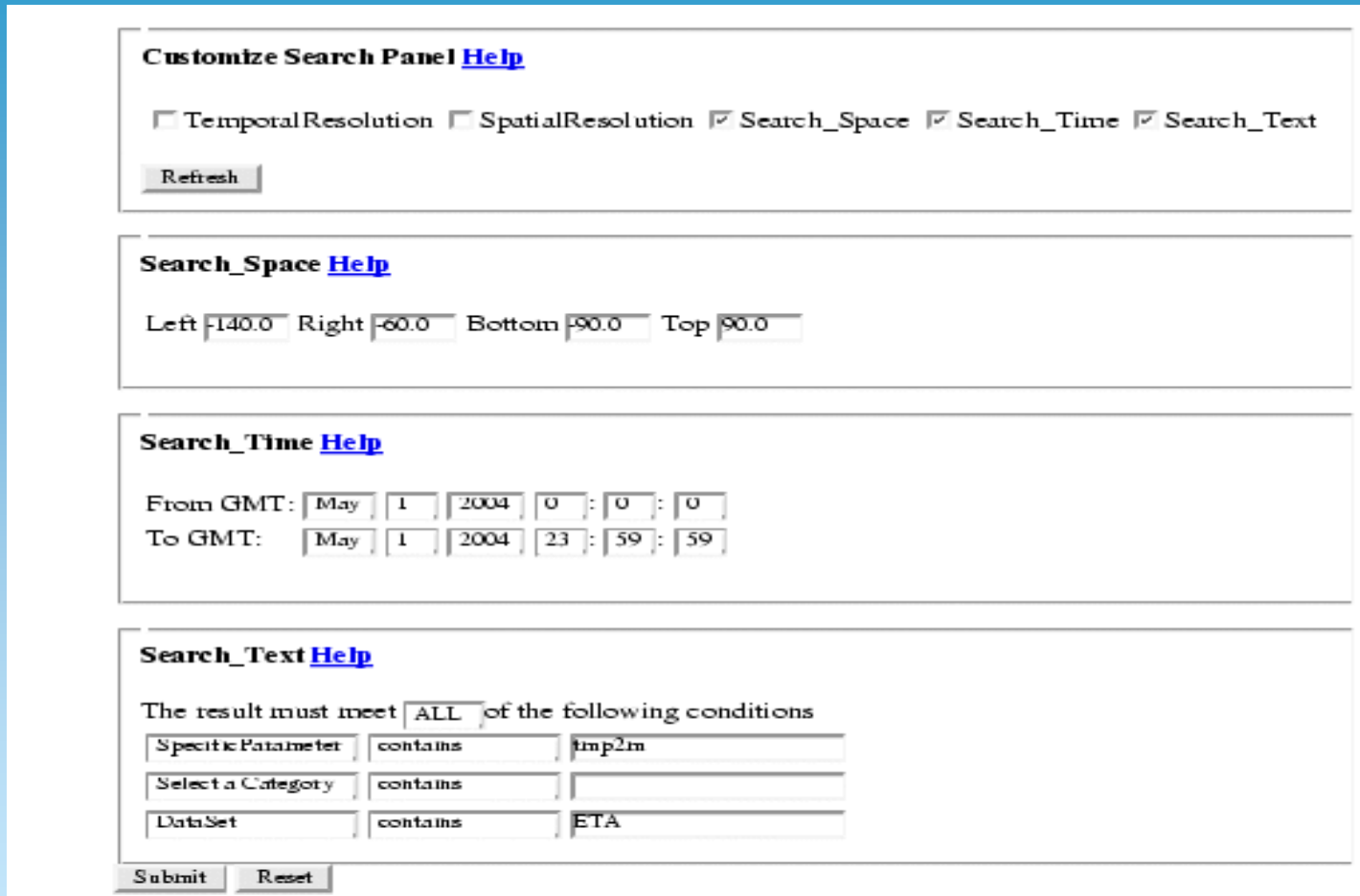
Based on

DISTRIBUTED METADATA SERVER

DIMES

(Yang, R, X. Deng, M. Kafatos, C. Wang, S. Wang, 2001 An XML-Based Distributed Metadata Server (DIMES) Supporting Earth Science Metadata" in Proc. 13th Intl. Conf. on Sci. and Stat. Database Manag. pp. 251-256, IEEE, Comp Soc.)

A DIMES Search Page -

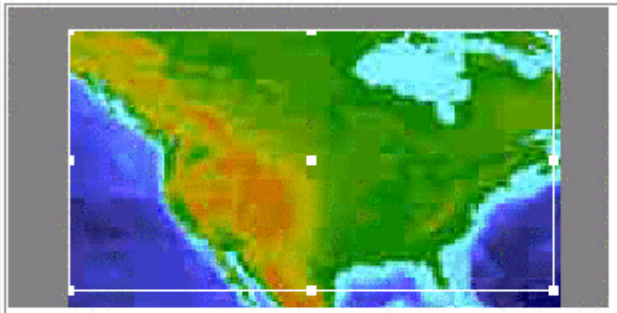


Result of DIMES search for tmp2m and ETA for 5/1/2004

Data sets found are listed below. You may click a data set name to find more information about that data set or click the "Order" button to order the data.

1. ETA every 3 hours fcst staring from 18Z29apr2004, download Apr 29 21:00 UTC Order!
2. ETA hourly fcst staring from 06Z01may2004, download May 01 08:32 UTC Order!
3. ETA every 3 hours fcst staring from 12Z29apr2004, download Apr 29 15:22 UTC Order!
4. ETA hourly fcst staring from 00Z01may2004, download May 01 04:32 UTC Order!
5. ETA every 3 hours fcst staring from 06Z29apr2004, download Apr 29 08:31 UTC Order!
6. ETA every 3 hours fcst staring from 00Z29apr2004, download Apr 29 04:28 UTC Order!
7. ETA every 3 hours fcst staring from 18Z30apr2004, download Apr 30 20:50 UTC Order!
8. ETA hourly fcst staring from 18Z29apr2004, download Apr 29 21:00 UTC Order!
9. ETA every 3 hours fcst staring from 12Z30apr2004, download Apr 30 15:17 UTC Order!
10. ETA every 3 hours fcst staring from 06Z30apr2004, download Apr 30 08:33 UTC Order!
11. ETA hourly fcst staring from 12Z29apr2004, download Apr 29 15:22 UTC Order!
12. ETA every 3 hours fcst staring from 18Z01may2004, download May 01 20:32 UTC Order!
13. ETA every 3 hours fcst staring from 00Z30apr2004, download Apr 30 04:28 UTC Order!
14. ETA hourly fcst staring from 18Z30apr2004, download Apr 30 20:50 UTC Order!
15. ETA every 3 hours fcst staring from 12Z01may2004, download May 01 14:56 UTC Order!
16. ETA hourly fcst staring from 12Z30apr2004, download Apr 30 15:17 UTC Order!
17. ETA every 3 hours fcst staring from 18Z28apr2004, download Apr 28 21:52 UTC Order!
18. ETA every 3 hours fcst staring from 06Z01may2004, download May 01 08:32 UTC Order!
19. ETA every 3 hours fcst staring from 12Z28apr2004, download Apr 28 20:39 UTC Order!
20. ETA hourly fcst staring from 06Z30apr2004, download Apr 30 08:33 UTC Order!
21. ETA every 3 hours fcst staring from 00Z01may2004, download May 01 04:32 UTC Order!
22. ETA hourly fcst staring from 00Z30apr2004, download Apr 30 04:28 UTC Order!
23. ETA hourly fcst staring from 18Z01may2004, download May 01 20:32 UTC Order!
24. ETA hourly fcst staring from 12Z01may2004, download May 01 14:56 UTC Order!

Region Selection: Longitude-Latitude for data set "ETA every 3 hours fcst staring from 12Z28apr2004, download Apr 28 20:39 UTC"



66.89 N

140.0 W 64.0 W

26.0 N

Zoom In Zoom Out

Set Tool Range: -140.0 -63.11 12.0 66.89 Grid Spacing: 0.11 X 0.11

Time range selected from: 4/28/2004 To: 5/1/2004

Temporal Coverage Selection: 4/30/2004

4/28/2004 5/1/2004

Function Selection:	Average	'100' selected
Parameter Selection:	shtflsfc	'shtflsfc' Selected

Air Pressure Selection: 1003

100 100

Select Exact Pressure: 100

Generate String

sdfopen http://nomad1.ncep.noaa.gov:9090/dods/eta/archive/eta20040428/_expr_{eta_12z}{ave(shtflsfc,t=3,t=4)}{-138:-64,

Metadata Descriptor Problems

- Descriptions of Variable names, Units, Text and other keywords are not uniform.
- Much of the description at NCEP is “Title” and defaults, for example, the vertical coordinate defaults to Pressure in mb! *(…lucky for us)*
- DODS descriptions do not always contain enough information, for example, how to describe unequally space vertical coordinate.
- Project to correct the data descriptions is long term but data managers have to be willing to make corrections consistent with scientific community.
- What are the community standards that we should use!

Excerpt from the metadata *info* section.

- GrADS-DODS Server -
- info for /gfs/gfs20031021/gfs_00z : dds das

- DODS URL: http://nomad1.ncep.noaa.gov:9090/dods/gfs/gfs20031021/gfs_00z

- Description: AVN fcst starting from 00Z21oct2003,
- Longitude: 0°E to 359°E
- (360 points, avg. res. 1.0°)
- Latitude: -90°N to 90°N
- (181 points, avg. res. 1.0°)
- Altitude: 1000 to 10
- (26 points, avg. res. 39.6)
- Time: 00Z21OCT2003 to 12Z28OCT2003
- (61 points, avg. res. 3.0 hours)
- Variables: (total of 114)
-
- absv ** absolute vorticity [/s]

More from a metadata *info* section.

- complete metadata listing:
- Global attributes:
- title: "NCEP/DOE Reanalysis (R-2), 4x daily rotating archive"
- convention: "COARDS"
- Variables
- absvprs: Grid
- _FillValue: 9.999E20
- long_name: "** absolute vorticity [/s] "
- absvprs: Array of 32 bit Reals [time = 0..287][lev = 0..16][lat = 0..72][lon = 0..143]
- _FillValue: 9.999E20long_name: "** absolute vorticity [/s] "
- time: Array of 64 bit Reals [time = 0..287]
- units: "days since 1-1-1 00:00:0.0"
- long_name: "Time"
- minimum: "00Z22MAR2004"
- maximum: "18Z01JUN2004"
- lev: Array of 32 bit Reals [lev = 0..16]
- units: "mb"
- long_name: "altitude"
- minimum: 1000
- maximum: 10
- lat: Array of 32 bit Reals [lat = 0..72]
- units: "degrees_north"
- long_name: "latitude"
- minimum: -90maximum: 90
- lon: Array of 32 bit Reals [lon = 0..143]
- units: "degrees_east"
- long_name: "longitude"
- minimum: 0
- maximum: 357.5

Result of a Constrained Query from the web browser

- The wget command:
- wget -O - "http://nomad1.ncep.noaa.gov:9090/dods/gfs/gfs20040604/gfs_00z.ascii?tmp[0:0][0:5][110:110][0:0]"

- returned the following data:

- tmp, [1][6][1][1]
- [0][0][0], 312.2
- [0][1][0], 310.7
- [0][2][0], 310.2
- [0][3][0], 309.5
- [0][4][0], 307.5
- [0][5][0], 302.7
- time, [1]
- 731737.0
- lev, [6]
- 1000.0, 975.0, 950.0, 925.0, 900.0, 850.0
- lat, [1]
- 20.0
- lon, [1]
- 0.0

DODS Servers (GDS) makes NCEP disk storage directly accessible to your PC!

- … Using http to extract data from the server:

http://140.90.198.156:9090/dods/eta/eta20030527/eta_00z.ascii?tmpprs[0:0][0:0][130:130] [290:290]

the order of the square bracked values is:

[time][level][lat][lon]

where lat is measured from the south pole (0) to NP (180)

In units represented by the metadata descriptor file.

(Use a “wget” and the URL in cron or a cgi-bin script provides needed values.)

…and Value Added Products!

- Other Commercial and Freeware client applications can access the GrADS-DODS GDS server and use the functionality built into the advanced software.
- As a VAR you can make VAPs from our GDS.

Use GDS to construct a value added product:

The probability of any weather element event, say for example, high or low temperature

E X A M P L E

Lets use the NCEP 1x1 degree (high resolution) Ensembles

NOMADS Ensemble Data Sets at NCEP

Metadata descriptor files describe all aspects of the data sets and are created uniquely from the headers of GRIB files.

- Real Time Operational Ensemble model data sets from GFS in 5 day rotating archive.
- Ensemble at Low resolution: 2.5 degrees, 00, 06, 12 and 18Z Ensemble Cycles, (ensemble control, “c0” at 00Z and GFS (MRF) for other cycles) out to 16 day (384-h) forecasts.
- Ensemble at High Resolution: 1 degree, 00, 06, 12, 18Z cycles out to 96-h forecasts.

…. Ensemble Data Sets on nomad3

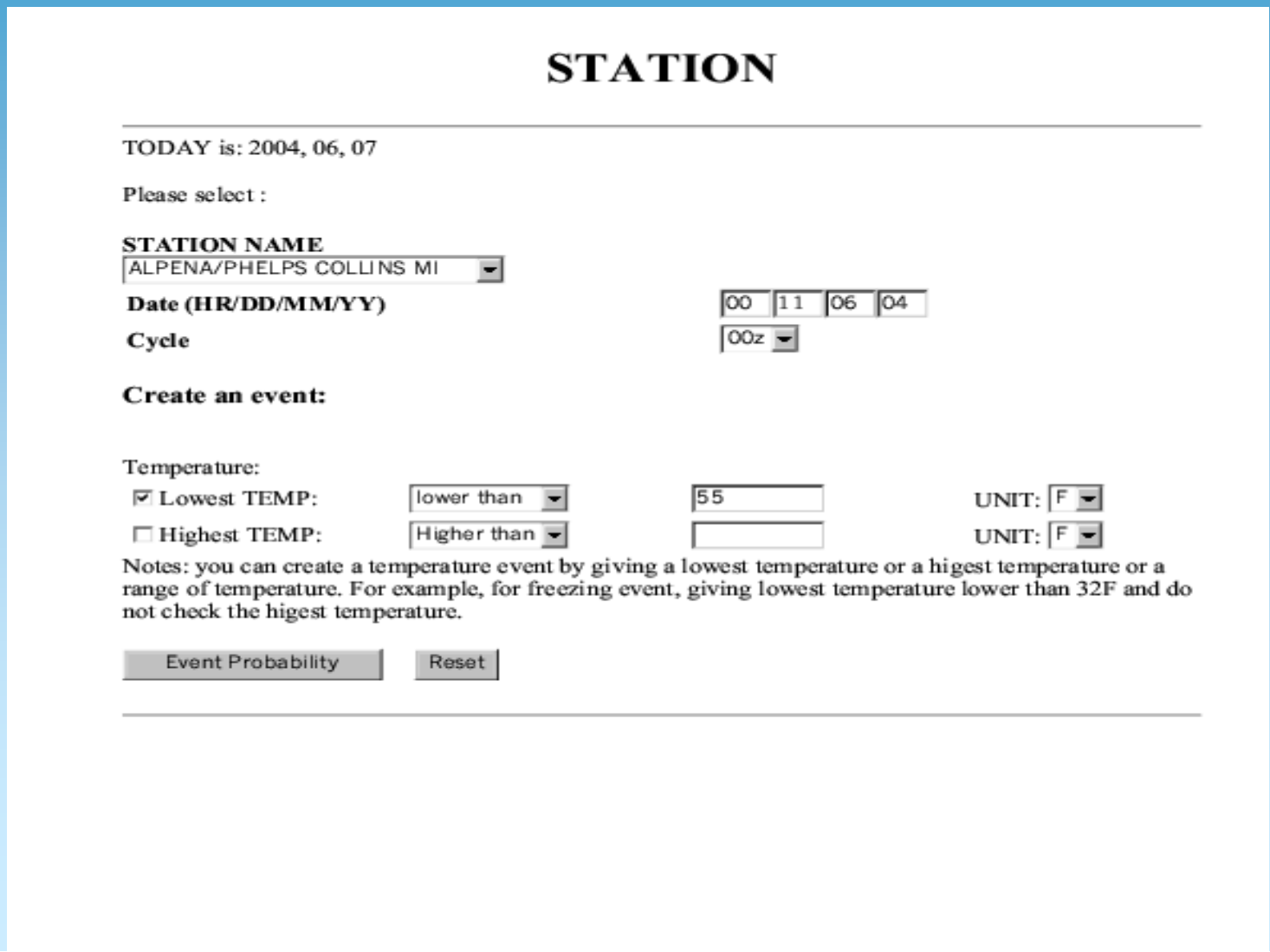
http://nomad3.ncep.noaa.gov/ncep_data

Plots, Data, Points of Contact

The following table list several data sets. By clicking on the appropriate command, you can (1) make plots, (2) FTP the files to your computer or (3) obtain documentation. At this time, some options are not available (N/A). BTW, we know that plots can, at times, be quite slow to produce.

Data Set	freq	plot	ftp	doc	gds	contact 1	contact 2
Forecasts							
GFS Ensemble low resolution	6 hours	plot	ftp2u	N/A	DODS	Jordan.Alpert@noaa.gov	jun.wang@noaa.gov
GFS Ensemble high resolution	6 hours	plot	ftp2u	N/A	DODS	Jordan.Alpert@noaa.gov	jun.wang@noaa.gov
Climate forecast	monthly	plot	ftp2u	N/A	DODS	Jordan.Alpert@noaa.gov	N/A
SEA ICE	daily	plot	ftp2u	N/A	DODS	Jordan.Alpert@noaa.gov	N/A
RUC	hourly	plot	ftp2u	N/A	DODS	Jordan.Alpert@noaa.gov	jun.wang@noaa.gov
AMIP/ETA	6 hours	plot	ftp2u	N/A	DODS	Jordan.Alpert@noaa.gov	jun.wang@noaa.gov
CDAS	6 hours	plot	ftp2u	N/A	DODS	Jordan.Alpert@noaa.gov	N/A

User Selects the Station Name from a list and set the date and forecast time, and the details of the desired event.



The (Perl) web page inserts the lon/lat of the station and creates constrained queries for each of the 11 Ensemble forecast components. A probability is constructed as frequency of the user picked event. Here the last 5 of the 11 ensembles are shown along with the probability of the selected event.

member=p1
URL is: http://nomad3.ncep.noaa.gov:9090/dods/enshires/archive/ens20040607/ensp1_00z_1x1.ascii?tmin2m[16:16][135:135][277:277]
tminmem=284.6

member=p2
URL is: http://nomad3.ncep.noaa.gov:9090/dods/enshires/archive/ens20040607/ensp2_00z_1x1.ascii?tmin2m[16:16][135:135][277:277]
tminmem=283.6

member=p3
URL is: http://nomad3.ncep.noaa.gov:9090/dods/enshires/archive/ens20040607/ensp3_00z_1x1.ascii?tmin2m[16:16][135:135][277:277]
tminmem=284.2

member=p4
URL is: http://nomad3.ncep.noaa.gov:9090/dods/enshires/archive/ens20040607/ensp4_00z_1x1.ascii?tmin2m[16:16][135:135][277:277]
tminmem=284.0

member=p5
URL is: http://nomad3.ncep.noaa.gov:9090/dods/enshires/archive/ens20040607/ensp5_00z_1x1.ascii?tmin2m[16:16][135:135][277:277]
tminmem=286.2

Event probability: 90%

NOMADS Real Time Project at NCEP 2004-2005

- Increased time and space resolution Operational model datasets, 1x1 deg Regional Ensembles, GFS 1x1 deg, 3hr, Eta 12km (#218 grid) 1and 3 hr and special cases, AMIP, re-analysis,…
- **BUFR Observations** "ready for the NCEP cycling analysis" with complex quality control – all observations; conventional, like ADPUPA, and non-conventional like Satellite and radar winds. (Certain restrictions apply for "restricted data sets" from Europe!)
- Integration of the BUFR obs and model grid fields using GDS server/clients.

“Operational – lizing” NOMADS

- Many and varied public and scientific community clients are utilizing NOMADS!
- We need to be more reliable. Operational budget for fail-over and operational management.
- Operational NOMADS for weather Service Regional centers and Weather Forecast Offices, for example, to allow the National Digital Forecast Database (5 km manual forecast products) interaction with forecasters for watches and warnings.

Other Real Time NOMADS Servers at NCEP

In addition to http://nomad3.ncep.noaa.gov

- http://nomad5.ncep.noaa.gov
- http://nomad2.ncep.noaa.gov
- http://nomad1.ncep.noaa.gov

nomad4 is a disk storage appliance soon to be on line like the above servers.


NOMADS LAKESIDE